Claims

1. Control circuit for a signal strength information dependent frequency response adaptation of an audio signal for an electrodynamic transducer (4), with
- a signal strength information determination means (2, 6) for determining a signal strength information according to the level of the audio signal, and
- a modifying means (3) for frequency selectively modifying the audio signal in response to the signal strength information such, that the electrodynamic transducer (4) converts the audio signal into a low distortion sound signal for high levels of an audio signal and with a flat frequency response for low levels of an audio signal,

whereby a lower frequency range of the audio signal is modified with a gain different to a gain of a higher frequency range of the audio signal, and a frequency (f_{g1}, f_{g2}, f_{g3}, f_{g4}, f_{g5}) separating the lower frequency range from the higher frequency range is shifted towards higher values for an increasing level of the audio signal and towards lower values for a decreasing level of the audio signal.

2. Control circuit according to claim 1,
characterised in
that the modifying means (3) comprises a high-pass filter, the cut-off frequency (f_{g1}, f_{g2}, f_{g3}, f_{g4}, f_{g5}) of which is shifted towards higher frequencies for increasing levels of the audio signal and is shifted towards lower frequencies for decreasing levels of the audio signal.

3. Control circuit according to claim 1 or 2,
characterised in
that the level of the audio signal is defined by a volume setting.

4. Control circuit according to claim 1 or 2,
characterised in
that the level of the audio signal is determined from a current amplitude or from a current energy content of the audio signal with respect to the full frequency range of the audio signal.

5. Control circuit according to claim 1 or 2,
characterised in

that the level of the audio signal is determined from a current amplitude or from a current energy content of a lower frequency range of the audio signal.

6. Control circuit according to claim 2,
characterised in
that the cut-off frequency of the high pass filter is shifted proportional to the square root of the audio signal peak amplitude.

7. Control circuit according to claim 2,
characterised in
that the cut-off frequency of the high pass filter is shifted proportional to the square root of the root mean square value of the audio frequency signal.

8. Control circuit according to one of the claims 1 to 7,
characterised in
that the modifying means (3) comprises a frequency range selective gain control for decreasing the gain of the higher frequency range of the audio signal corresponding to a decrease in the volume setting.

9. Control circuit according to one of the claims 1 to 8,
characterised in
that the modifying means (3) comprises a frequency range selective gain control for decreasing the gain of the lower frequency range of the audio signal corresponding to an increase in the level of the audio signal.

10. Control circuit according to claim 8,
characterised in
that the gain of the modifying means (3) in the lower frequency range of the audio signal is independent of the volume setting.

11. Control circuit according to claim 10,
characterised in
that the gain of the modifying means (3) in the lower frequency range of the audio signal has a constant value or decreases for a decreasing level of the audio signal, the gain being higher than for the higher frequency range of the audio signal.

12. Control circuit according to one of the claims 1 to 11,
characterised in

that a level of the audio signal is determined according to the electro-mechanical properties of the electrodynamic transducer (4).

13. Control circuit according to one of the claims 1 to 12,
characterised in
that the cut-off steepness of a filter and/or of a frequency range progresses approximately with the square of the frequency.

14. Method for a signal strength information dependent frequency response adaptation of an audio signal for an electro-dynamic transducer (4), comprising the following steps:
- determining a signal strength information according to the level of the audio signal, and
- frequency selectively modifying the audio signal in response to the signal strength information such, that the electro-dynamic transducer (4) converts the audio signal into a low distortion sound signal for high levels of an audio signal and with a flat frequency response for low levels of an audio signal,

whereby a lower frequency range of the audio signal is modified with a gain different to a gain of a higher frequency range of the audio signal, and a frequency (f_{g1}, f_{g2}, f_{g3}, f_{g4}, f_{g5}) separating the lower frequency range from the higher frequency range is shifted towards higher values for an increasing level of the audio signal and towards lower values for a decreasing level of the audio signal.

15. Method according to claim 14,
characterised in
that the method comprises a step for defining the level of the audio signal by reading a volume setting.

16. Method according to claim 14,
characterised in
that the method comprises a step determining the level of the audio signal from a current amplitude or from a current energy content of the audio signal with respect to the full frequency range of the audio signal.

17. Method according to claim 14,
characterised in
that the method comprises a step for determining the level of the audio signal from a current amplitude or from a current energy content of a lower frequency range of the audio signal.

18. Method according to claim 14,
characterised in
that the method comprises a step for shifting the frequency separating the lower frequency range from the higher frequency range proportional to the square root of the audio signal peak amplitude.

19. Method according to claim 14,
characterised in
that the method comprises a step for shifting the frequency separating the lower frequency range from the higher frequency range proportional to the square root of the root mean square value of the audio frequency signal.

20. Method according to one of the claims 14 to 19,
characterised in
that the method comprises a step for decreasing the gain of the higher frequency range of the audio signal corresponding to a decrease in the volume setting.

21. Method according to one of the claims 14 to 20,
characterised in
that the method comprises a step for decreasing the gain of the lower frequency range of the audio signal corresponding to an increase in the level of the audio signal.

22. Method according to claim 20,
characterised in
that the method comprises a step for controlling the gain in the lower frequency range of the audio signal independent of the volume setting.

23. Method according to claim 22,
characterised in
that the method comprises a step for adjusting the gain in the lower frequency range of the audio signal at a constant value or by decreasing the value of the gain for an increasing level of the audio signal, whereby the gain of the lower frequency range of the audio signal is adjusted to a higher value than that for the higher frequency range of the respective audio signal.

24. Method according to one of the claims 14 to 23,
characterised in

that the method comprises a step for weighting the level and the frequency distribution of the audio signal according to the electro-mechanical properties of the electro-dynamic transducer (4).

25. Method according to one of the claims 14 to 24,
characterised in
that the method comprises a step for controlling the transition in the gain from the lower frequency range to the higher frequency range such, that the steepness of the transition is set approximately proportional to the square of the frequency.

26. Computer software product for use on an audio system, implementing a control circuit according to one of the claims 1 to 13 by processing a method according to one of the claims 14 to 25 when being stored in a storage means and being executed by a processing means of the audio system.

27. Mobile telecommunication terminal comprising a control circuit according to one of the claims 1 to 13 for a level dependent frequency selective adaptation of an audio signal to the electro-mechanical properties of an electrodynamic transducer operated by the mobile terminal.

28. Mobile telecommunication terminal comprising a storage means and a processing means for executing a computer software product according to claim 26 for a level dependent frequency selective adaptation of an audio signal to the electro-mechanical properties of an electrodynamic transducer operated by the mobile terminal.